Exhibit 24
Geotechnical Report

City of Natchitoches

Highway 478 Development Tract

Preliminary Geotechnical Investigation Services
LED Site Evaluation
LA Highway 478
Natchitoches Parish, Louisiana
Report No. 04-20-061

Prepared For:

City of Natchitoches
c/o Cothren, Graff, Smoak, Engineering, Inc.
6305 Westport Avenue
Shreveport, Louisiana 71129

Prepared By:

Geotechnical Testing Laboratory, Inc.
226 Parkwood Drive
Alexandria, Louisiana 71301

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Preliminary Geotechnical Investigation Services
LED Site Evaluation
LA Highway 478
Natchitoches Parish, Louisiana
Report No. 04-20-061

Introduction:

This report transmits the findings of a geotechnical investigation performed for the above-referenced project. The purpose of this investigation was to define and evaluate the general subsurface conditions in the general vicinity of a planned new industrial complex. Specifically, the study was planned to determine the following:

- Subsurface stratigraphy within the limits of our exploratory borings.
- Classification, strength, and compressibility characteristics of the foundation strata.
- Suitable foundation systems and allowable soil bearing pressures.
- Construction requirements for the placement of select earth fills.

The purpose of this report is to provide the owner, structural engineer, civil engineer, and other design team professionals with preliminary recommendations to consider for the design and construction of the proposed project. This report should not be used by the contractor in lieu of project plans and specifications.

Project Authorization:

Formal authorization to perform the work was provided by Mrs. Julianne Smoak on behalf of the City of Natchitoches (Client), by accepting our March 17, 2020 written proposal. A written Notice to Proceed was provided on March 19, 2020. Field procedures were conducted on April 15 & 17, 2020. To accomplish the intended purposes, a three-phase study program was conducted which included:

- a field investigation consisting of three exploratory test borings with samples obtained at selected intervals;
- a lab testing program designed to evaluate the expansive and strength characteristics of the subsurface soils; and,
- an engineering analysis of the field and laboratory test data for preliminary foundation design recommendations.

No additional analysis was requested. A brief description of the field and laboratory test procedures are provided in the Appendix.

Project Description:

We understand the project will consist of a analyzing a 155.00-acre site for the purpose of developing an industrial park. Preliminary sizes of the structures and structural information is not available. The scope of work for this investigation and report is to provide shallow and deep foundation recommendations based upon materials being removed from high elevations and placed at lower elevations.

For the purpose of this report, we have assumed that maximum column loads will not exceed approximately 200 kips (1 kip = 1,000 pounds), and that maximum continuous wall loads will be approximately one (1) to five (5) kips per linear foot. Grade changes are unknown at the present time, and will be assumed to be a nominal 2 to 10 feet maximum to reach the design

grades. If larger grade changes are anticipated, these should be discussed with our geotechnical engineer prior to finalizing design.

If any of this information should change significantly or be in error, it should be brought to our attention so that we may review recommendations made in this report.

Site Conditions:

The project site is southwest of the intersection of Bayou Blue Road and LA Highway 478 near Cypress, Natchitoches Parish, Louisiana. Information compiled by Google Earth indicates the site slopes downward to the south on the order of 35 to 40 feet, and contains several peaks and valleys. A drainage canal is oriented east to west through the site. At time of drilling, the site was vegetated with weeds, underbrush and timber. The drilling rig experienced extreme difficulty moving about the site. Consequently, the borings were drilled on top of hills, and in accessible areas.

Subsurface Stratigraphy:

The subsurface conditions at the proposed site were explored by drilling a total of three (3) borings to depths between approximately 30 and 100 feet. The borings were located in the field by the drilling crew as shown on the Plan of Borings included in the Appendix of this report.

The stratification of the soils encountered during field drilling operations is presented on the boring logs in the Appendix. The stratification of the subsurface materials shown on the boring logs represents the subsurface conditions encountered at the actual boring locations and variations may occur across the site. The lines of demarcation represent the approximate boundary between the soil types, but the actual transition may be gradual. The following subsurface descriptions are of a generalized nature to highlight the major stratification features. The boring logs should be reviewed for more detailed information.

In order of increasing depth, the borings generally encountered the following soil strata beneath the surface: silty sand (SM), clayey sand (SC), lean to fat clay (CL-CH), sandy lean clay (CL)s, lean clay (CL) and fat clay (CH).

Groundwater Conditions:

Seepage was observed at depths of five (5) to 16 feet during advancement of the test borings. Groundwater was measured at depths of one (1) to nine (9) feet below existing ground surface upon completion of the borings. The shallow hydrostatic levels are most likely from recent heavy area rains and is expected to subside to more normal levels during periods of dry weather. The typical groundwater elevation is estimated to be around ten (10) feet and this level is not expected to impact shallow excavations during construction. But the subsurface water regime is always subject to change with variations in climatic conditions and will likely coincide seasonal fluctuations. Future construction activities may also alter the surface and/or subsurface drainage patterns of this site. Therefore, groundwater conditions should be explored at the start of construction by others due to short-term observations by our field crew.

Perched water may be briefly encountered in low quantities during earthwork and is typically due to storage of recent rainfall or by a barrier to capillary evaporation. Where perched water is encountered the contractor should expect to excavate gravity drainage ditches to divert it away from the construction area. The depth of the ditches should be at least two (2) to three (3) feet deeper than the lowest exterior footing elevation. Additionally, soft, wet and pumpable soils can be expected below perched water tables. In structural areas, these should be removed to firm ground and replaced with select fill soils compacted to project specifications as defined later in this report.

Foundation Recommendations:

The soil parameters represented herein are based on single borings placed at irregular intervals across the site. The deviations between the boring locations indicate variable subsurface conditions across the area and should not be assumed as representative of the entire site. Thus, the findings presented herein should be considered preliminary in nature and should be confirmed through further investigation prior to development of the subject parcel. Prior to developing any section of the tract, a specific subsurface investigation should be obtained and tailored to the individual project. This report should not be used in lieu of a final geotechnical investigation addressing site specific needs for the intended projects.

Detailed information on structural systems and planned grading is currently unavailable. Based on the size and type of anticipated structures, as well as the findings from this investigation, a system of shallow footings with an on-grade floor slab, in conjunction with the recommended subgrade preparation is believed to be the most practical and economical means of support. However, heavier building loads could result in the use of deep foundations. Recommendations for both foundation types are discusses separately below.

Depending upon the site grading, Potential Vertical Rise (PVR) values should vary between less than one (1) inch to approximately 1.5 inches. One (1) inch of PVR is generally accepted as the maximum allowable value for design and construction in the geographical area. The surficial soils encountered by the borings are considered to be slightly to moderately expansive. The shallow subgrade preparation for shallow foundations should not require more than two (2) feet of compacted select fill below all areas of the floor slabs.

Foundation Subgrade Preparation:

To prepare for foundation and soil supported floor slab construction, we recommend that all topsoil, vegetation, roots, and any soft soils in the building area be stripped from the site and either properly disposed or stockpiled for later use in landscaping. Utilities should be located and rerouted as necessary.

Any trees or tree stumps located within the building pad should be grubbed and removed. The diameter of the excavation should be at least three (3) feet larger than the tree diameter and dry soils and roots ½ inch in diameter or greater should be grubbed to a minimum depth of four (4) feet below finished subgrade elevation. The resulting depression should be backfilled and compacted as recommended in the Select Fill Section of this report.

Shallow Foundations:

To remediate the variable soil conditions in the surficial zone and provide a consistent subgrade for slab support, GTL recommends that a uniform layer of density-approved select fill be provided beneath the floor slab. After stripping the site, the building pad should be cut to an elevation which allows the placement of at least two (2) feet of density-approved select fill below the final subgrade elevation for the floor slab. The select fill building pad should extend at least five (5) feet beyond the edge of the building.

After stripping and undercutting, as required by the grading plan and the over-excavation as required herein, the building area should be proof-rolled with a heavy, loaded pneumatic-tired vehicle such as a 20 to 25 ton loaded dump truck. It is recommended that all areas beneath the floor slab be proof-rolled to identify loose or soft soils. All proof-rolling and undercutting activities should be witnessed by GTL or authorized representative and should be performed during a period of dry weather. Any weak areas which yield under the proof-roll, or any areas with a tendency to pump should be mitigated. Such mitigation may include over-excavation and

backfilling, reprocessing to remove moisture, modification with lime or cement admixture, or using geotextiles. In the event such mitigation is required, the geotechnical engineer should be contacted to design an appropriate procedure.

After stripping, excavating where required, and proof-rolling but prior to placing fill, the exposed soils should be scarified and then processed to a moisture content between one (1) percentage point below and three (3) percentage points above the Standard Proctor optimum. The subgrade soils should be re-compacted to a density of at least 95 percent of the Standard Proctor (ASTM D-698) maximum dry density for a depth of at least eight (8) inches below the surface.

Select Fill:

After the subgrade has been prepared and inspected, fill placement may begin. Select fill material should be free of organic or other deleterious materials, homogeneous mixture, have a maximum particle size of three (3) inches, have a liquid limit less than 40 and plasticity index between 8 and 20, and consist of silty-clayey sands (SM-SC), low plasticity sandy clays (CL), or clayey sands (SC) as defined by the Unified Soil Classification System. In addition to the above requirements, the material should have a minimum of 30 percent retained on the No. 200 sieve. If a fine-grained material is used for fill, very close moisture content control will be required to achieve the recommended degree of compaction.

Fill should be placed in maximum lifts of eight (8) inches of loose materials and should be compacted within the range of one (1) percentage point below to three (3) percentage points above the optimum moisture content value and a minimum of 95 percent of the maximum density as determined by the Standard Proctor (ASTM D-698) test. If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying.

The building pad should extend at least five (5) feet beyond the edge of the structure prior to sloping. Each lift of compacted soil should be tested and inspected by the soils engineer or his representative prior to placement of subsequent lifts. As a guideline, it is recommended that field density tests be taken at a frequency of not less than one (1) test per 2,500 square feet of surface area per lift or a minimum of four (4) per lift for each tested area for the building.

Shallow Footing Bearing Capacities:

Shallow foundations may utilize individual or continuous footings bearing within the upper five (5) feet of the surficial zone. The provision of at least two (2) feet of select fill should be anticipated to provide a suitable subgrade for the floor slabs. Typical bearing capacity values for shallow spread footings may vary from between approximately 2,000 psf to 2,500 psf for soils with consistencies of medium dense or medium stiff. Strip footings for continuous wall loads may be estimated between 1,500 and 1,800 pounds per linear foot.

The factor of safety for the above bearing values is 3.0. Total settlement is estimated to be on the order of one (1) inch or less for foundation units designed in accordance with recommendations provided herein. Differential settlements are estimated to be on the order of ½ inch or less. Approximately half of this settlement is expected to occur during construction. The remaining long-term settlement of ½ inch (¼ occurring differentially) should be tolerable. These settlement estimates are valid for footings up to five (5) feet in plan dimensions. If footings larger than five (5) feet are required, this office should be contacted to issue additional recommendations to mitigate the potential for higher settlement.

Deep Foundations:

As previously discussed, consideration may be given to placing heavier structural or special equipment loads on deep foundations consisting of drilled shafts or driven piles. Recommendations for auger cast piles have been omitted since these piles are not economically competitive until the quantity exceeds 100. However, if auger cast piles are considered, this office should be contacted to provide additional recommendations.

Heavier structural loads should be supported on straight-sided, cast-in-place concrete shafts founded at a minimum depth of 25 feet and may be terminated at a maximum depth of 50 feet below the existing ground surface. The table below presents the estimated allowable single shaft capacities for 18- and 24-inch diameter shafts founded at depths between 25 and 50 feet below present ground surface.

Diameter of Shaft (inches)	Depth of Shaft (feet)	Allowable Single Shaft Capacity (kips)	
		Compressive	Uplift
18	25	40	20
	30	50	30
	35	60	35
	40	70	45
	45	125	65
	50	150	90

Diameter of Shaft (inches)	Depth of Shaft (feet)	Allowable Single Shaft Capacity (kips)	
		Compressive	Uplift
24	25	55	30
	30	70	40
	35	85	50
	40	100	60
	45	200	90
	50	225	125

The factor of safety for these calculations is estimated to be 2.0, and the estimated uplift capacities include the weight of the shaft. Shafts should have a minimum diameter of 18 inches even if the actual bearing pressure is less than the design value. If multiple shafts are used for heavier loads, the individual shafts should be placed at face-to-face spacings no closer than three (3) times the shaft diameter.

Groundwater will most likely be encountered in the drilled shafts. Casing for installing drilled shafts is always a possible necessity when dealing with the unknowns inherent with subsurface conditions. It is prudent for contract documents to include this option.

Drilled Shaft Considerations:

Due to the presence of a shallow groundwater table with a hydrostatic head, consideration should be given to installing the drilled shafts using a slurry method which maintains a constant slurry level equal to or slightly above the hydrostatic water level. If the shafts can be sealed from water intrusion using casing, the slurry option may be eliminated.

It is recommended that the design and construction of drilled shafts should generally follow methods outlined in the manual titled Drilled Shafts: Construction Procedures and Design Methods (Publication No: FHWA-IF-99-025, August 1999).

We emphasize that close engineering supervision is essential during installation of the drilled shaft foundations in order to assure that construction is performed in accordance with the plans and specifications. Also, to ensure proper construction of the drilled shafts at this site, close coordination between the drilling and concreting operations is considered to be of great importance. Detailed inspection of drilled shaft construction should be made to verify that the shafts are vertical and founded in the proper bearing stratum and to verify that all loose materials have been removed prior to concrete placement.

Driven Piles:

The superstructure loads may also be supported on Class B creosote treated timber piles founded at a minimum depth of 30 feet below the existing ground surface. The following table presents preliminary allowable pile capacities.

Depth	Allowable Single Pile Capacity (kips)	
(feet)	Compressive	Uplift
30	30	15
35	45	20
40	55	25
45	90	40
50	125	55

If the above allowable timber pile loads are found to be inadequate, consideration may be given to using 12-inch square per-cast, pre-stressed concrete piles. Such piles may be selected from the following table. The factor of safety for these and the above values is 2.0.

Depth	Allowable Single Pile Capacity (kips)	
(feet)	Compressive	Uplift
30	60	35
35	75	45
40	90	55
45	125	65
50	175	100

Total settlement is estimated to be on the order of one (1) inch or less for driven piles. Differential settlements (between adjacent piles or clusters) are estimated to be on the order of ½ inch or less. In order to utilize the estimated single pile capacities above, the piles should be driven at face-to-face spacings no closer than three (3) times the pile butt diameter.

Seismicity:

Based on Section 1613 of the IBC-2012, a Site Class of D has been estimated for this site based on subsurface information to a depth of 100 feet. According to the USGS website for Seismic Hazard Design Parameters, the project site has a mapped 0.2 second spectral response acceleration (S_s) of 0.115 g. The project also has a mapped 1.0 second spectral response acceleration (S_l) of 0.064. The design spectral response accelerations, S_{DS} and S_{Dl}, were determined to be 0.123 g and 0.103 g, respectively.

The presence of medium dense sands below the water table results in a moderate potential for liquefaction to occur.

Geotechnical Risk:

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools which geotechnical engineers use are generally empirical

and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations presented in the preceding sections constitutes GTL's professional estimate of those measures that are necessary for the proposed structure to perform according to the proposed design based on the information generated and referenced during this evaluation, and GTL's experience in working with these conditions.

Limitations:

The exploration and analysis of the site conditions reported herein are considered preliminary in detail and scope and are not intended to form a basis for pavement and foundation design. The information submitted is based on the available soil information only and not on design details for the intended projects.

The findings, recommendations or professional advice contained herein have been made after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology. No other warranties are implied or expressed.

The scope of services did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors, or unusual or suspicious items or conditions are strictly for the information of the client. Prior to purchase or development of this site, an environmental assessment is advisable.

The scope of services did not include a geologic investigation to address any faults, large scale subsidence, or other macro geologic features not specifically addressed in this report or the agreement between GTL and the client.

After plans are more complete, it is recommended that the soils and foundation engineer be retained to provided a subsurface investigation tailored to meet the specific needs of the project.

This report has been prepared for the exclusive use of our client for the general application for the referenced project. GTL cannot be responsible for interpretations, opinions, or recommendations made by others based on the data contained in this report.

This report was prepared for general purposes only and should not be considered sufficient for purposes of preparing accurate plans for construction. Contractors reviewing this report are advised that the discussions and recommendations contained herein were provided exclusively to and for use by the project owner.

END OF REPORT TEXT

SEE FOLLOWING APPENDIX w/BORING LOGS & TEST RESULTS

APPENDIX A

FIELD AND LABORATORY PROCEDURES

Field and Laboratory Procedures
LED Site Evaluation
Louisiana Highway 478
Natchitoches Parish, Louisiana
Report Number 04-20-061

I. Field Operations:

Subsurface conditions were evaluated by advancing three (3) intermittent sample borings on April 15 and 20, 2020 within the project area. Boring locations were selected in areas readily accessible to our drilling equipment, and staked in the field by representatives of Geotechnical Testing Laboratory, Inc. An illustration of the approximate boring locations with respect to the areas investigated is provided on the Plan of Borings provided in this report. Descriptive terms and symbols used on the logs are in accordance with the Unified Soil Classification System (USCS).

An track-mounted all-terrain drilling rig was used to make the test borings. Each boring was advanced in the dry using flight auger drilling techniques. Intermittent undisturbed samples were obtained in the following manner.

Standard penetration tests were performed in accordance with ASTM D-1586 procedures. This test is conducted by recording the number of blows required for a 140-pound hammer falling 30 inches to drive a split-spoon sampler eighteen inches into the substrata. Depths at which split-spoon samples were taken are indicated by two crossed lines in the "Samples" column on the Log of Boring. The number of blows required to drive the sampler for each 6-inch increment were recorded. The penetration resistance is the number of blows required to drive the split-spoon sampler the final 12-inches of penetration. Information related to the penetration resistance is presented under the "Field Data" heading of the Log of Boring as the Standard Penetration (Blows/Foot). These samples were visually examined, logged, and packaged for transport to our laboratory.

Cohesive strata were sampled in accordance with ASTM D-1587 procedures by means of pushing a thin walled Shelby tube a distance of two feet into the substrata. Consistency of the sample was measured in the field by means of a calibrated hand penetrometer. Such values, in tons per square foot, are provided under the "Field Data" heading on the Log of Boring. Depths which these undisturbed samples were obtained are indicated by a shaded portion in the "Samples" column of the Log of Boring. All samples were prudently extruded in the field were sealed to maintain "in-situ" conditions, labeled, and packaged for transport to our laboratory.

The presence of ground water was monitored during drilling operations. Initial water seepage readings are provided under "Groundwater Information" in the right hand column of the Log of Boring. Upon boring completion, water levels were allowed to rise and stabilize for several minutes prior to final water readings. These readings are found under “Groundwater Information”. Soil sloughing from the walls of the boring are also recorded here as depth of cave-in.

II. Laboratory Studies:

Upon return to the laboratory, all samples were visually examined and representative samples were selected for testing. Tests were performed on selected samples recovered from the test borings to verify classification and to determine pertinent engineering properties of the substrata. Individual test and ASTM designations are provided below:

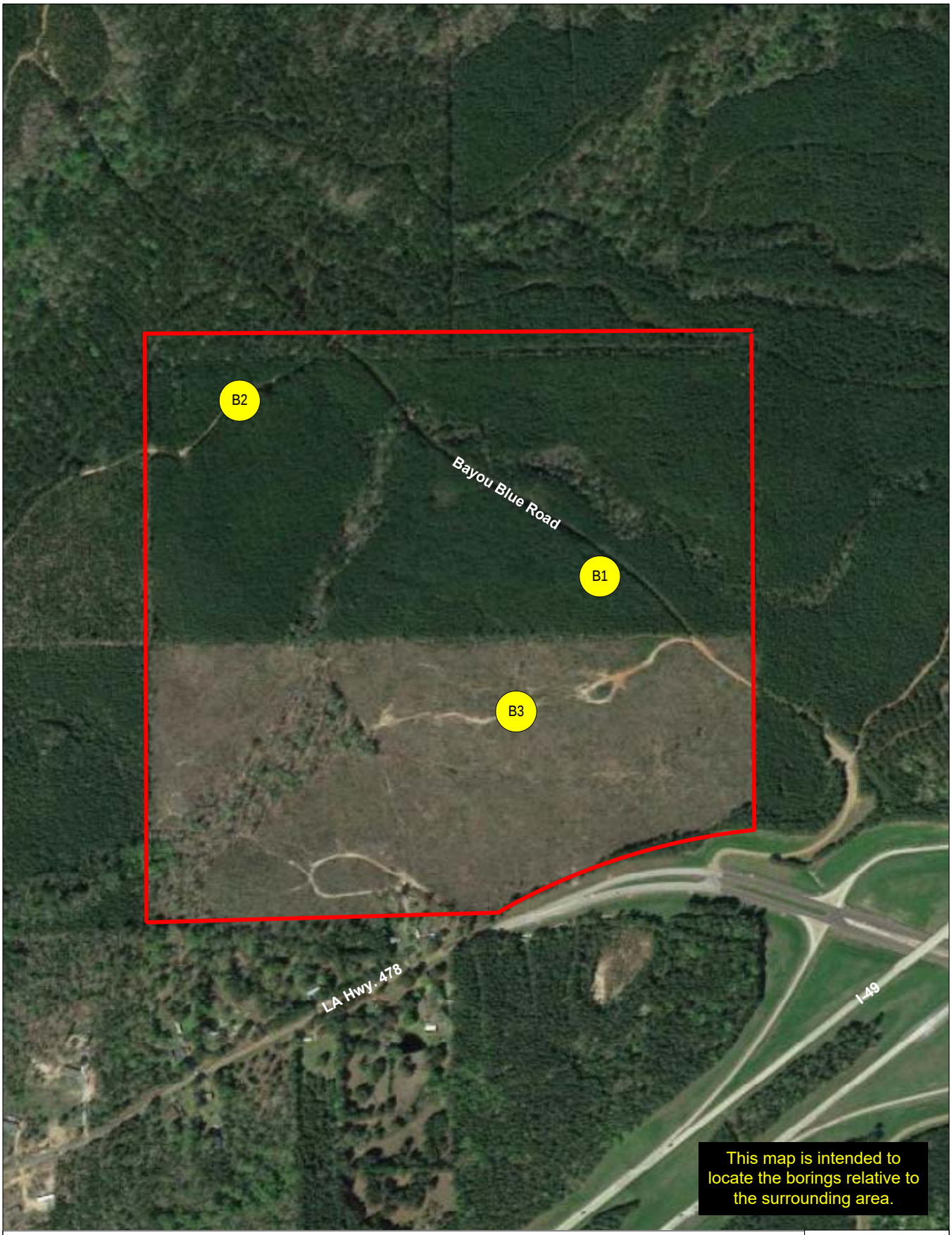
Test	ASTM Designations
Atterberg Limits	ASTM D4318
Moisture Content	ASTM D2216
Percent Minus #200	ASTM D1140
Unconfined Compression (Soil)	ASTM D2166

Results for soil classifications are located on the Log of Boring in their respective columns under "Laboratory Data."

Samples obtained during our field studies and not consumed by laboratory testing procedures will be retained free of charge for a period of 30 days. Arrangements for storage beyond that period of time must be made in writing to ***Geotechnical Testing Laboratory, Inc.***

APPENDIX B

PLAN OF BORINGS



PLAN OF BORINGS

PROJECT

LED SIte Evaluation, LA Highway 478, Natchitoches Parish, Louisiana

SCALE	DATE	FILENAME	
Not to Scale	4/21/2020	04-20-061	***City of Natchitoches***

N

APPENDIX C

BORING LOGS AND SOIL CLASSIFICATION CHART

LOG OF BORING B-1

Geotechnical Testing Laboratory, Inc.
226 Parkwood Drive
Alexandria, LA 71301
Telephone: (318) 443-7429

CLIENT: **City of Natchitoches**
PROJECT: **LED Site Evaluation**
LOCATION: **Natchitoches Parish, Louisiana**
FILE NO.: **04-20-061**
DRILL DATE: **4/15/20**

DRILLING METHOD(S): **Diedrich D-50, Rotary Wash**
DRILLER: **R. Leggett** CHECKED BY: **K. Gorsha**

GROUNDWATER INFORMATION:
Water Seepage Noted @ 5.0 Feet While Drilling
Water Level @ 1.0 Foot After 24 Hours
Boring Walls Collapsed @ 1.5 Feet

SURFACE ELEVATION: **Not Determined**

FIELD DATA				LABORATORY DATA							
SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	MINUS NO. 200 SIEVE (%)	DRY DENSITY (Lbs./Cu.Ft.)	COMPRESSIVE STRENGTH (Lb./Sq. Ft.)	DESCRIPTION OF STRATUM
			N = 11	11							Medium Dense Yellowish Brown & Gray Silty SAND (SM)
			N = 12	14	NP	NP	NP	33			
			N = 34	12							- dense below 4.0 feet
	5		N = 30	15	NP	NP	NP	30			7.0'
			N = 15	17							Very Stiff Gray Sandy LEAN CLAY (CL)s
	10		N = 26	18	32	18	14	60			12.0'
			N = 45	26	NP	NP	NP	40			Dense Yellowish Brown & Gray Silty SAND (SM)
	15										18.0'
			N = 59	30	36	19	17	91			Hard Brown & Gray LEAN CLAY (CL) w/sandy silt (ML)s laminations
	20										23.0'
			N = 57	25	NP	NP	NP	22			Very Dense Gray Silty SAND (SM)
	25										
			N = 20	26							- medium dense, yellowish red & gray @ 29.0 feet
	30										30.0'
											Boring Terminated @ 30.0 Feet

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE

NOTES:
See Plan of Borings for Location
GPS Coordinates - 31° 39' 38.06 N / 93° 06' 29.41" W
Stratification and Groundwater Depths Are Not Exact

LOG OF BORING B-2

Geotechnical Testing Laboratory, Inc.
226 Parkwood Drive
Alexandria, LA 71301
Telephone: (318) 443-7429

CLIENT: **City of Natchitoches**
PROJECT: **LED Site Evaluation**
LOCATION: **Natchitoches Parish, Louisiana**
FILE NO.: **04-20-061**
DRILL DATE: **4/15/20**

DRILLING METHOD(S): **Diedrich D-50, Rotary Wash**
DRILLER: **R. Leggett** CHECKED BY: **K. Gorsha**

GROUNDWATER INFORMATION:
Water Seepage Noted @ 12.5 Feet While Drilling
Water Level @ 1.0 Feet After 24 Hours
Boring Walls Collapsed @ 3.5 Feet

SURFACE ELEVATION: **Not Determined**

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	MINUS NO. 200 SIEVE (%)	DRY DENSITY (Lbs./Cu.Ft.)	COMPRESSIVE STRENGTH (Lb./Sq. Ft.)	DESCRIPTION OF STRATUM
			N = 15	19							Medium Dense Red & Gray Clayey SAND (SC)
			N = 20	19	28	17	11	32			- yellowish brown & gray below 2.5 feet
	5		N = 31	19							- dense @ 4.0 feet
			N = 33	23							
			N = 30	23	31	17	14	26			
	10		N = 32	22							
	15		N = 16	27	31	18	13	34			- medium dense @ 14.0 feet
											17.0'
	20		N = 25	29	NP	NP	NP	19			Medium Dense Yellowish Brown & Gray Silty SAND (SM)
											23.0'
	25		N = 25	24							Very Stiff brown & Gray LEAN CLAY (CL) w/sand
	30		N = 59	19	33	18	15	79			- hard below 29.0 feet
	35		N = 44	22							- w/silty sand (SM) layers @ 34.0 feet
	40		N = 33	21							- w/sandy silt laminations @ 39.0 feet
											43.5'
	45		N = 70	31	NP	NP	NP	25			Very Dense Brown & Gray Silty SAND (SM)
	50		N = 61	30							50.0'
											Boring Terminated @ 50.0 Feet

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE

NOTES:
See Plan of Borings for Location
GPS Coordinates - 31° 39' 23.38 N / 93° 06' 37.47" W
Stratification and Groundwater Depths Are Not Exact

LOG OF BORING B-3

Geotechnical Testing Laboratory, Inc.
226 Parkwood Drive
Alexandria, LA 71301
Telephone: (318) 443-7429

CLIENT: **City of Natchitoches**
PROJECT: **LED Site Evaluation**
LOCATION: **Natchitoches Parish, Louisiana**
FILE NO.: **04-20-061**
DRILL DATE: **4/17/20**

DRILLING METHOD(S):
Diedrich D-50, Rotary Wash

DRILLER: **R. Leggett** CHECKED BY: **K. Gorsha**

GROUNDWATER INFORMATION:
Water Seepage Noted @ 16.0 Feet While Drilling
Water Level @ 9.0 Feet Upon Completion
Boring Walls Collapsed @ 19.0 Feet

SURFACE ELEVATION: **Not Determined**

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	MINUS NO. 200 SIEVE (%)	DRY DENSITY (Lbs./Cu.Ft.)	COMPRESSIVE STRENGTH (Lb./Sq. Ft.)	DESCRIPTION OF STRATUM
			N = 7	11							Loose Brown Silty SAND (SM) 2.0'
	5		N = 10	20	37	18	19	36			Medium Dense Red Clayey SAND (SC)
			N = 10	21							5.0'
			N = 11	26							Stiff Yellowish Brown & Gray LEAN to FAT CLAY (CL-CH)
			P = 3.00	35	54	22	32	96	87	5155	- very stiff @ 8.0 feet
	10			21						**	- w/silty sand (SM) layer @ 10.0 feet
	15		N = 9	25	46	21	25	98			- stiff @ 14.0 feet 16.0'
	20		N = 20	28							Very Stiff Brown & Gray LEAN CLAY (CL) w/sandy silt (ML)s laminations
	25		N = 35	25	31	19	12	92			- hard below 24.0 feet
	30		P = 4.50+	25					91	8015	
	35		N = 69	32							- w/silty sand (SM) layer @ 34.0 feet
	40		N = 45	27	38	19	19	95			42.0'
	45		N = 50-8"	29							Very Dense Brown & Gray Silty SAND (SM)
	50		N = 50-6"	25	NP	NP	NP	42			
	55		N = 44	30							

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE

NOTES:
See Plan of Borings for Location
GPS Coordinates - 31° 39' 34.99 N / 93° 06' 20.99" W
Stratification and Groundwater Depths Are Not Exact
** = Distrubed Sample

GTL LOG - LOG A GNNL01.GDT - 4/22/20 08:04 - K:\GINT PROJECTS\2020 JOBS\04-20-061.GPJ

LOG OF BORING B-3

Geotechnical Testing Laboratory, Inc.
226 Parkwood Drive
Alexandria, LA 71301
Telephone: (318) 443-7429

CLIENT: **City of Natchitoches**
PROJECT: **LED Site Evaluation**
LOCATION: **Natchitoches Parish, Louisiana**
FILE NO.: **04-20-061**
DRILL DATE: **4/17/20**

DRILLING METHOD(S): **Diedrich D-50, Rotary Wash**

DRILLER: **R. Leggett** CHECKED BY: **K. Gorsha**

GROUNDWATER INFORMATION:
Water Seepage Noted @ 16.0 Feet While Drilling
Water Level @ 9.0 Feet Upon Completion
Boring Walls Collapsed @ 19.0 Feet

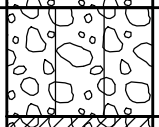
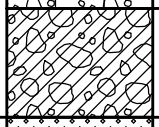
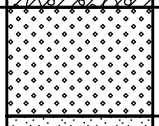
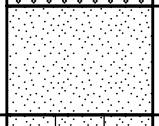
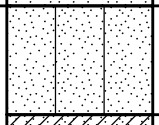
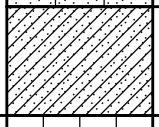
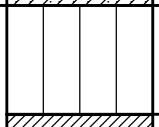
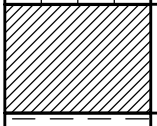
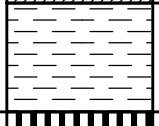
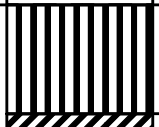
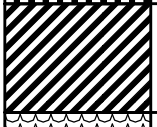
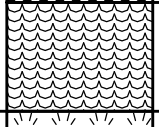
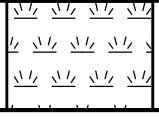
SURFACE ELEVATION: **Not Determined**

FIELD DATA				LABORATORY DATA							
SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	MINUS NO. 200 SIEVE (%)	DRY DENSITY (Lbs./Cu.Ft.)	COMPRESSIVE STRENGTH (Lb./Sq. Ft.)	DESCRIPTION OF STRATUM
											Very Dense Brown & Gray Silty SAND (SM) *(continued)*
	60		N = 50-5"	26							
	65		N = 50-9"	29	NP	NP	NP	22			
	70		N = 50-5"	30							
	75		N = 50-8"	28							77.0'
	80		N = 68	26	59	22	37	98			Hard Brown & Gray FAT CLAY (CH)
	85		N = 70	33							
	90		N = 72	34							
	95		N = 66	33	67	25	42	99			
	100		N = 55	32							100.0'
											Boring Terminated @ 100.0 Feet

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE

NOTES:
See Plan of Borings for Location
GPS Coordinates - 31° 39' 34.99 N / 93° 06' 20.99" W
Stratification and Groundwater Depths Are Not Exact
** = Distrubed Sample

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS